

What is claimed is:

1. A write-once-read-many optical recording medium comprising:  
a first inorganic thin film; and  
at least one of a second inorganic thin film and an organic thin film,  
wherein the first inorganic thin film comprises at least "R" and "O," wherein "R" represents at least one element selected from the group consisting of Y, Bi, In, Mo, V and lanthanum series elements; and "O" represents oxygen atom, and  
the second inorganic thin film and the organic thin film are capable of suppressing at least one of deformation and breakage of the first inorganic thin film and receiving the change of state of the first inorganic thin film.
2. A write-once-read-many optical recording medium according to Claim 1, wherein the change of state is at least one selected from the group consisting of fusing, change of composition, diffusion, change of crystalline state, oxidation and reduction.
3. A write-once-read-many optical recording medium according to Claim 1, wherein the first inorganic thin film further comprises an element "M," wherein the element "M" is at least one selected from the group consisting of Al, Cr, Mn, Sc, In, Ru, Rh, Co,

Fe, Cu, Ni, Zn, Li, Si, Ge, Zr, Ti, Hf, Sn, Pb, Mo, V and Nb.

4. A write-once-read-many optical recording medium according to Claim 3, wherein the first inorganic thin film has a composition represented by  $R_xM_yO$ , wherein "x" and "y" are atomic ratios and satisfy the following condition:  $[x/(x+y)] \geq 0.3$ ; and "M" represents the element "M."

5. A write-once-read-many optical recording medium according to Claim 1, wherein the first inorganic thin film comprises the element "R" as an oxide of "R" (RO) and as another form than the oxide.

6. A write-once-read-many optical recording medium according to Claim 3, wherein the first inorganic thin film comprises the element "M" as an oxide of "M" (MO) and the element "R" as another form than an oxide.

7. A write-once-read-many optical recording medium according to Claim 3, wherein the first inorganic thin film comprises the element "M" as an oxide of "M" (MO) and the element "R" as an oxide of "R" (RO).

8. A write-once-read-many optical recording medium according to Claim 3, wherein the first inorganic thin film comprises

the element "M" as an oxide of "M" (MO) and the element "R" as an oxide of "R" (RO) and as another form than the oxide.

9. A write-once-read-many optical recording medium according to Claim 1, wherein the first inorganic thin film comprises a bismuth oxide.

10. A write-once-read-many optical recording medium according to Claim 1, wherein the first inorganic thin film comprises elementary bismuth and a bismuth oxide.

11. A write-once-read-many optical recording medium according to Claim 3, wherein the first inorganic thin film has a composition represented by  $\text{Bi}_a(4\text{B})_b\text{O}_d$ , wherein "4B" represents at least one of Group 4B elements of the Periodic Table of Elements; and "a," "b" and "d" are atomic percentages and satisfy the following conditions:  $10 \leq a \leq 40$ ,  $3 \leq b \leq 20$ ,  $50 \leq d \leq 70$ .

12. A write-once-read-many optical recording medium according to Claim 11, wherein the at least one Group 4B element is at least one of Si and Ge.

13. A write-once-read-many optical recording medium according to Claim 3, wherein the first inorganic thin film has a composition represented by  $\text{Bi}_a(4\text{B})_b\text{X}_c\text{O}_d$ , wherein "4B" represents at

least one of Group 4B elements of the Periodic Table of Elements; "X" represents at least one element selected from the group consisting of Al, Cr, Mn, In, Co, Fe, Cu, Ni, Zn, Ti and Sn; and "a," "b," "c," and "d" are atomic percentages and satisfy the following conditions:  $10 \leq a \leq 40$ ,  $3 \leq b \leq 20$ ,  $3 \leq c \leq 20$ ,  $50 \leq d \leq 70$ .

14. A write-once-read-many optical recording medium according to Claim 13, wherein the at least one Group 4B element is at least one of Si and Ge.

15. A write-once-read-many optical recording medium according to Claim 1, wherein the organic thin film has a major absorption band at wavelengths longer than wavelengths at which information is at least one of recorded and reproduced.

16. A write-once-read-many optical recording medium according to Claim 15, wherein the organic thin film has a complex refractive index with an imaginary part smaller than that of the first inorganic thin film at the wavelengths at which information is at least one of recorded and reproduced.

17. A write-once-read-many optical recording medium according to Claim 15, wherein the organic thin film has an absorption band not belonging to the major absorption band in the vicinity of the wavelengths at which information is at least one of

recorded and reproduced.

18. A write-once-read-many optical recording medium according to Claim 1, wherein the second inorganic thin film comprises at least one of ZnS and ZnS-SiO<sub>2</sub>.

19. A write-once-read-many optical recording medium according to Claim 1, wherein the first inorganic thin film is arranged between the second inorganic thin film and the organic thin film.

20. A write-once-read-many optical recording medium according to Claim 1, further comprising at least one of a substrate, a reflective layer and a cover layer.

21. A write-once-read-many optical recording medium according to Claim 20, comprising at least the substrate, the first inorganic thin film, the organic thin film and the reflective layer arranged in this order.

22. A write-once-read-many optical recording medium according to Claim 20, comprising at least the substrate, the organic thin film, the first inorganic thin film and the reflective layer arranged in this order.

23. A write-once-read-many optical recording medium according to Claim 20, comprising at least the substrate, the reflective layer, the first inorganic thin film, the organic thin film and the cover layer arranged in this order.

24. A write-once-read-many optical recording medium according to Claim 20, comprising at least the substrate, the reflective layer, the organic thin film, the first inorganic thin film and cover layer arranged in this order.

25. A write-once-read-many optical recording medium according to Claim 20, comprising at least the substrate, the second inorganic thin film, the first inorganic thin film, the organic thin film and the reflective layer arranged in this order.

26. A write-once-read-many optical recording medium according to Claim 20, comprising at least the substrate, the organic thin film, the first inorganic thin film, the second inorganic thin film and the reflective layer arranged in this order.

27. A write-once-read-many optical recording medium according to Claim 20, comprising at least the substrate, the first inorganic thin film, the second inorganic thin film and the reflective layer arranged in this order.

28. A write-once-read-many optical recording medium according to Claim 20, comprising at least the substrate, the reflective layer, the second inorganic thin film, the first inorganic thin film, the organic thin film and the cover layer arranged in this order.

29. A write-once-read-many optical recording medium according to Claim 20, comprising at least the substrate, the reflective layer, the organic thin film, the first inorganic thin film, the second inorganic thin film and the cover layer arranged in this order.

30. A write-once-read-many optical recording medium according to Claim 20, comprising at least the substrate, the reflective layer, the second inorganic thin film, the first inorganic thin film and the cover layer arranged in this order.

31. A write-once-read-many optical recording medium according to Claim 1, on which recording marks capable of yielding reproducing signals at three or more levels can be formed and the types of the recording marks can be identified based on the reproducing signal levels.

32. A write-once-read-many optical recording medium according to Claim 1, on which information can be at least one of

recorded and reproduced according to a partial response maximum likelihood (PRML) signal processing system.

33. A write-once-read-many optical recording medium according to Claim 1, on which recording marks can be formed by the photoabsorption function of the first inorganic thin film through at least one of the following (1) to (11):

- (1) deforming at least one of the first inorganic thin film and the second inorganic thin film;
- (2) changing the complex refractive index of at least one of the first inorganic thin film and the second inorganic thin film;
- (3) changing the composition of at least one of the first inorganic thin film and the second inorganic thin film;
- (4) fusing the first inorganic thin film;
- (5) diffusing constitutional elements of the first inorganic thin film into at least one of the second inorganic thin film and the organic thin film;
- (6) changing at least one of the crystalline state and crystalline structure of the first inorganic thin film;
- (7) at least one of oxidizing and reducing a constitutional element of the first inorganic thin film;
- (8) changing the composition distribution of the first inorganic thin film;
- (9) changing the volume of the organic thin film;
- (10) changing the complex refractive index of the organic thin



film; and

(11) forming cavities in the organic thin film.

34. A write-once-read-many optical recording medium according to Claim 33, on which recording marks capable of yielding reproducing signals at three or more different levels can be formed in a plane direction and a thickness direction of at least one of the first inorganic thin film and the organic thin film.

35. A write-once-read-many optical recording medium according to Claim 33, on which recording marks capable of yielding reproducing signals at three or more different levels can be formed in a plane direction and a thickness direction of at least one of the first inorganic thin film and the second inorganic thin film.

36. A write-once-read-many optical recording medium according to Claim 1, on which information can be at least one of recorded and reproduced using light at a wavelength of 500 nm or less.

37. A process for recording and reproducing information on a write-once-read-many optical recording medium,  
the write-once-read-many optical recording medium comprising:

a first inorganic thin film; and

at least one of a second inorganic thin film and an organic thin film,

wherein the first inorganic thin film comprises at least "R" and "O," wherein "R" represents at least one selected from the group consisting of Y, Bi, In, Mo, V and lanthanum series elements; and "O" represents oxygen atom, and

the second inorganic thin film and the organic thin film are capable of suppressing at least one of deformation and breakage of the first inorganic thin film and receiving the change of state of the first inorganic thin film,

the process comprising forming a recorded area by the photoabsorption function of at least one of the first inorganic thin film and the organic thin film at wavelengths at which at least one of recording and reproduction is performed.

38. A process for recording and reproducing information according to Claim 37, further comprising:

forming recording marks capable of yielding reproducing signals at three or more different levels; and

identifying the types of the recording marks based on the reproducing signal levels.

39. A process for recording and reproducing information according to Claim 37, further comprising at least one of recording and reproducing information on the medium according to a partial

response maximum likelihood (PRML) signal processing system.

40. A process for recording and reproducing information according to Claim 37, further comprising forming recording marks by the photoabsorption function of the first inorganic thin film through at least one of the following (1) to (11):

- (1) deforming at least one of the first inorganic thin film and the second inorganic thin film;
- (2) changing the complex refractive index of at least one of the first inorganic thin film and the second inorganic thin film;
- (3) changing the composition of at least one of the first inorganic thin film and the second inorganic thin film;
- (4) fusing the first inorganic thin film;
- (5) diffusing constitutional elements of the first inorganic thin film into at least one of the second inorganic thin film and the organic thin film;
- (6) changing at least one of the crystalline state and crystalline structure of the first inorganic thin film;
- (7) at least one of oxidizing and reducing a constitutional element of the first inorganic thin film;
- (8) changing the composition distribution of the first inorganic thin film;
- (9) changing the volume of the organic thin film;
- (10) changing the complex refractive index of the organic thin film; and

(11) forming cavities in the organic thin film.

41. A process for recording and reproducing information according to Claim 37, further comprising forming recording marks in a plane direction and a thickness direction of at least one of the first inorganic thin film and the organic thin film, the recording marks being capable of yielding reproducing signals at three or more different levels.

42. A process for recording and reproducing information according to Claim 37, further comprising forming recording marks in a plane direction and a thickness direction of at least one of the first inorganic thin film and the second inorganic thin film, the recording marks being capable of yielding reproducing signals at three or more different levels.

43. A process for recording and reproducing information according to Claim 37, further comprising at least one of recording and reproducing information on the medium using light at a wavelength of 500 nm or less.